

A COMPARISION OF E-WASTE MANAGEMENT POLICIES OF INDIA WITH OTHER COUNTRIES- A CASE STUDY

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ABSTRACT

E-waste is the term considered for electronics waste. Another term WEEE is also used which means a waste of electrical and electronics equipment. E-waste is a new field of research as per Indian concept. The world generated approx. 45 million tonnes of e-waste in 2016 as per the United Nations report. This amount of e-waste is equal to the weight of 4500 Eiffel towers. India's contribution to this e-waste is more than 4 %. Variety of products are available in the electronics market due to availability of lots of electronics companies. As per the government. The initiative "Made in India" foreign companies are coming to set up their organization in India. They are setting up their manufacturing units in India. Today, Latest technology is available at a comparatively cheaper rate. Due to this reason, today Indians are changing their e-gadgets like their clothes. This ultimately leads to increase in generation of e-waste. Second main reason for huge e-waste generation of e-waste in India is the population of our country. Most of the population is in their young age in our country. They use the latest electronics gadgets for their daily needs. Every mobile manufacturer companies launching new mobile phones with in one or two months. The new product is coming with the latest features and software version. Due to the change in technology, youngsters of India are changing their electronics products very frequently. This also leads to the increase in e-waste generation. As in India, awareness of hazardous effects of e-waste is very low. This is a very alarming stage for Indian as e-waste causes so many serious diseases. Electronic industry is not a neat and clean industry as considered earlier. It causes kidney failure, serious lung infection and adverse effect on nervous system, etc. The study was conducted to compare the Indian e-waste management policies with other countries to find out the limitations in Indian policies.

KEYWORDS: E-waste, WEEE, Policies, Northern Indian States & Other Countries

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ABBREVIATIONS

WEEE - Waste of Electrical & Electronic Equipments

REP - Extended Producer Responsibility

EPR - Extended Producer Responsibility

PRO - Producer Responsibility Organization

NSES - National Strategy for Electronics Stewardship

RoHS - Reduction of Hazardous Substances

PCS - Producer Compliance Schemes

ESM - Environmentally Sound Management

EU - EUROPEAN UNION

1. INTRODUCTION

E-waste is a kind of solid waste. If we do land filling of e-waste, it releases dangerous gases and also it contaminate with the ground water. It is very dangerous than other solid waste as it has very adverse effect on human health and the environment also. In the USA, the fastest growing stream of Municipal Solid Waste (MSW) could be e-waste as because people now a days, like to buy, upgrade and discard electronic products (Kahhat et al.[8], 2008a). In India, same scenario exist, peoples buy new products and throw the old one at their homes. This is due to the lack of awareness regarding the dangerous effects of e-waste on human health. The peoples of India are not aware about the harmful materials that any electronic products have. Electronics products are the assembly of thousands of parts. Some are hazardous and others are valuable substances. Some of hazardous materials are lead, mercury, cadmium, barium etc. it, some precious metals are like gold, silver etc in small quantity. That's why the management of e-waste becomes essential to recover the valuable materials and safety of hazardous materials. The paper shows the comparison of policies regarding e-waste management of India and other foreign countries. In India most of the recycling processes are organized by unauthorized sector. Up to 90 % of the e-waste generated is managed by unauthorized sector. Only 10 % of e-waste is managed by formal channel. The study becomes essential to find out the limitations in our existing system. This is due to the lack of rules and regulation imposed by the govt.

2. LITERATURE SURVEY

OECD [17], 2014 tell about two schemes, one is organizational schemes and another is financial schemes. He discusses about the producer's responsible organization (PRO) to manage e-waste in European countries. These schemes explain how the e-waste will be managed. As per Namias [15], 2013 Europeans produce approximately 20 kilograms of e-waste/person/year, while U.S. residents produce about 7 kilograms of e-waste/person/year. This discrepancy may be attributed to the varying definitions of e-waste; in the U.S. electronic waste generally consists of information technology (IT) and telecommunications equipment, monitors and televisions, whereas in Europe it also includes large household appliances, cooling and freezing appliances, and medical devices. He also tells the importance of extended producer's responsibility (EPR) in the USA. Lee & Na [09], 2010, compare the E-waste management systems operating in East Asian countries in efforts to identify future challenges, they highlights the three points. The first point is about cost sharing (physical and financial) as applied to the producers, consumers, local governments and recyclers, in the E-waste management systems. The second point, they highlighted is the environmental and economical impacts of these E-waste management systems on recycling technology, trans-boundary movement of E-wastes and Design for Environment (DfE). The final point highlighted is the possibility for international cooperation in the region in terms of E-waste management systems. Otmar Deubzer [18], 2011 discussed the responsibilities of the producers of e-items. He suggested that the best way to manage the e-waste is that producer itself sets up their recycling unit. It is the responsibility of the producers to

collect, treat and dispose the e-waste collected from the household and from the various organizations. If producers are not willing to do this, they have to pay fees for collection, treatment and safe disposal of e-waste. As per him, it is the duty of the producer to look after their product after its end of useful life.

Liu, X., Tanaka [10], M. & Matsui, Y. (2006) explains about the adverse impacts of e-waste recycling on the environment and human. There is a peak increase in generation of domestic e-waste and illegal shipment from other countries. They blame lack of national management strategies for this. Majority of Chinese citizens are not willing to pay for recycling of e-waste. This is due to their traditional thinking that the value of any product never comes to zero even after the end of its useful life. Rules and regulations regarding e-waste were drafted in China, but there are some deficiencies are observed in these. Even EPR are not well defined in the country. TCIL Enterprise [5], 2007 is an Indian govt. enterprise. Along with prime telecom engineering firm, they also provide e-waste recycling facility for safe disposal of e-waste in India. The enterprise defines the responsibilities of individual and bulk consumers regarding e-waste. The organization also discusses the responsibility of the producers to manage e-waste generated.

Morrissey [14], 2004 discuss the policies for e-waste management in European country. He discussed about reduction of hazardous substances (RoHS) system. He also discuss about the treatment of e-waste. As per Morrissey priorities should be given to prevent the use of hazardous substances in e-products. He suggested to set up a form which treats and eliminate the hazardous waste. He suggested a monitoring tool to monitor the e-waste management in his country. He clearly defined the Role of Extended Producer's responsible (REP) and also discuss about the REP channel. Johnson, B. [7] (2014) discussed the policies of e-waste in the USA. He explain National Strategy for Electronics Stewardship (NSES) for the USA. This strategic focus on Product Design and Research, Safe and Responsible Management of Used Electronics along with Export Flows and International Collaboration. He also explains that Federal government required to use certified electronics recyclers only to manage e-waste. Federal electronics banned from landfills. He stressed on to identify the potential hazards from different electronics recycling technologies. Cave, S. [3] (2017) explain about the recycling of e-waste in Germany. As per Cave, S. Germany was one of the first European countries to introduce landfill limiting policies in the 1990s. They defined the role of extended producer's responsibility. According to the National Ministry for Environment [19], (2017) producer responsibility for the major shift in Germany from waste disposal to waste avoidance and recovery and provide for recycling initiatives. Ministry of Commerce [12] (2007), explains the law for e-waste management. This law considers the enacted for the purpose of prevention and controlling environment from pollution. It also acts as safeguard for human health. This law defined how to prevent the environment and peoples of China from hazardous effects of solid waste. Ministry of Commerce [13] (2006), discussed the purpose of controlling and reducing the pollution caused by electronic products. The ministry promotes the manufacturer to use reduction of hazardous substances (RoHS) in their electronic products. The ministry also promotes the sales of these types of electronic products. Liza, L. & Francis, M. [11] (2016) discussed about the Basel convention in Nairobi. The purpose of this convention is to control the trans boundary movement of hazardous waste. This also focuses on the safe disposal of the hazardous waste.

De Oliveira [4], C.R., Bernardes, A.M. & Gerbase, A.E. (2012) discussed the recycling of e-waste and related issues of sustainable development issues. They conducted their study in Brazil. They discuss the new National Policy of e-waste on the future of electronic waste (e-waste). There are different e-waste collection systems and recycling processes have been applied globally over the last 10 years. They study the systems used in different countries and compares the

world situation to the current Brazilian reality. Efficient collection centres play very important role in e-waste management in any country. The collection system is the weakest section of Brazilian e-waste management system. The formal channel is not present in Brazil as waste pickers pick the waste from houses. The aim of the study conducted by Bo, B. & Yamamoto, K. [2] (2010) is to identify current situations, processes and related issues of e-waste recycling in China and Japan. He studies and compare the characteristics of both the countries. He concluded that in Japan most of the e-products are collected through home appliance recycling tickets whereas China include a high reuse rate is present. They focus on reuse of the products rather than to dispose of. European Municipal Agency [6] (2013) said that we have to improve our existing waste management method to make it more efficient. The agency also focuses on shifting waste management to waste hierarchy. They focus on the points of reducing waste disposal, waste prevention, reuse, recycling and recovery. Rajya Sabha Secretariat [19] (2011) discuss the importance of the term reduction of hazardous substance (RoHS) in the manufacturing of electrical and electronic equipment. The Govt. of India provide the guidelines for the electronic products manufacturer and instructed the manufacturer not to use lead, mercury and other hazardous substances in the manufacturing of electronic products.

2.1 Objective Of The Study

The purpose of the study is to compare the Indian govt. policies of e-waste management with other countries to find out the limitations in our existing system.

2.2 Research Methodology

E-waste management policies of India considered to be compared with other countries. Our study base on three section, these are:

- **Available Finances Schemes:** Under this section we consider the availability of financial support to manage e-waste in various countries. As financial schemes help in increase of e-waste collection.
- **Policies and Refgulation for E-waste Management:** It is related to rules and regulations regarding e-waste management present in the various countries.
- **Responsibility:** This section defines that who is responsible for the management of e-waste like manufacturer, recycling agency etc.

3. RESULTS & DISCUSSIONS

The policies are compared by doing an extensive study of literature. The e-waste management policies of India are compared with Europe, USA, United Kingdom, Japan, Germany, China, Kenya by considering these three points in mind:

- Available Finance
- Policies & Regulation for E-waste Management
- Responsibility

3.1 Available Finances Schemes

Table 1

EUROPE	<ul style="list-style-type: none"> The 2009 Finance Law introduced an Extended Producer's Responsibility (REP) mechanism for diffuse hazardous waste from households (DDD)(United Nation, n.d. [27]). Organizational schemes- PROs are directly in charge of managing e-waste, they collect fees from producers and use the gathered finance. In financial schemes - PROs are not directly in charge of managing e-waste, they use fees collected from producers to support municipalities(OECD, 2014).
USA	<ul style="list-style-type: none"> Advance Recycling Fee (ARF)(Namias, 2013).
UNITED KINGDOM	<ul style="list-style-type: none"> If PCS collects in bulk it has to finance the excess or retain the income. If PCS collection is in less quantity it has to pay a compliance fee per ton.(waste-management-world [29], 2016)
JAPAN	<ul style="list-style-type: none"> Local governments are obligated to collect E-wastes at the consumer's request, but the cost of collection is levied on the consumer. (Lee & Na, 2010).
GERMANY	<ul style="list-style-type: none"> Producers shall at least finance the collection, treatment and environmentally sound disposal of e-waste from private households disposed of at collection facilities. Each producer shall finance the treatment of the waste from its own products put on the market after 13 August 2005(Otmar Deubzer, 2011).
CHINA	<ul style="list-style-type: none"> Insufficiencies of the draft regulations are explained by considering the effectiveness of the legislation, system coverage, system financing, the producer's responsibilities and ensuring compliance(Liu et al., 2006).
KENYA	<ul style="list-style-type: none"> No financing systems for e-waste management
INDIA	<ul style="list-style-type: none"> Financing and organizing a system to meet the costs involved in the environmentally sound management of e-waste generated from the 'end of life' of its own products and historical waste available on the date from which these rules come in to force. Such financing system shall be transparent. The producer may choose to establish such financial system either individually or by joining a collective scheme(Enterprise, 2007).

3.2 Policies and Regulations

Table 2

EUROPE	<ul style="list-style-type: none"> Basis of the hazardous waste management policy Preventing and reducing hazardous substances as far as possible REP channels Regulations on waste management facilities Progressive elimination of toxic, persistent and bio-accumulative substances Inventory of hazardous waste, waste treatment/elimination sites and contaminated zones Dissemination of technical and scientific information on the various health and environmental aspects of hazardous waste Prevention of illegal international trafficking of hazardous waste(Morrissey, 2004).
USA	<p>NSES Actions Help:</p> <ul style="list-style-type: none"> Ensure that electronics are designed, purchased and managed in a more sustainable manner Protect human health and the environment in the U.S. and abroad Promote new and innovative technologies Facilitate coordination across government and with stakeholders Catalyse new efforts within and outside of government Electronic Product Environmental Assessment Tool Expansion Regulation for Government-wide Electronics Management Strengthening Cathode Ray Tube Regulations(Johnson, 2014)

Table 2: Contd.,	
UNITED KINGDOM	<ul style="list-style-type: none"> • Waste Electrical and Electronic Equipment (WEEE) Directive • Restriction of Hazardous Substances (RoHS) Directive • EU Directive on Energy-using-Products (EuP) • EU Directive on Registration, Evaluation and Authorization of Chemicals (REACH) • E-waste regulations in Japan, China, India, Korea, United States, Canada and many other nations • Basel Convention Partnership on the ESM of E-waste in the Asia- Pacific region • Partnership for Action on Computing Equipment (PACE) STEP Initiative • Regional 3R Forum in Asia(Umesh, 2013)
JAPAN	<ul style="list-style-type: none"> • Japanese Home Appliance Recycling Law was formulated in June 1998 and enacted in 2001 (METI, 2006) • Ministry of the Environment and the Ministry of Economy, Trade and Industry (METI) • Computer Recycling Law in 2003 • Law for Promotion of Effective Utilisation of Resources requires producers of PCs to take-back PCs from households and establish a take-back and recycling system for PCs
GERMANY	<ul style="list-style-type: none"> • Germany was one of the first European countries to introduce landfill limiting policies in the 1990s. • Germany's high recycling rates are driven by its policy and initiatives to waste management. • According to the EEA, a ban on land filling un-pre-treated municipal waste, producer responsibility and a focus on separate collection have proven to be important policy initiatives for successful recycling rates in Germany. • The Closed Substance Cycle and Waste Management Act of 1996. • Germany's approaches appear to have engendered positive public attitude and uptake of policies for recycling and waste to energy.(Finance ministry, 2017) (Cave, [03] 2017).
CHINA	<ul style="list-style-type: none"> • Law of the People's Republic of China on the Prevention and Control of Pollution by Solid Wastes, effective from Apr. 1996, amended in Dec 2004 (Ministry of Commerce, 2007). • Notification on Importation of the Seventh Category of Wastes (No. 19/2000), effective from Feb. 2000 (Ministry of Commerce, 2006) • Administrative Measures on the Pollution Control of Electronic Information Products, effective from Mar. 2007(Ministry of Commerce, 2006). • Administrative Measure on Pollution Prevention of Waste Electrical and Electronic Equipment (No. 40/2007), effective from Feb. 2008 (Sarah et al., 2012). • Circular Economy Promotion Law (Presidential Order No. 4), effective from Jan. 2009(Sarah et al., 2012). • Regulations on Recovery Processing of Waste Electrical and Electronic Products (No. 551/2009), effective from Jan. 2011 (Sarah [22] et al., 2012).
KENYA	<p>There are Two Main International Conventions Regulating Waste Management:</p> <ul style="list-style-type: none"> • The Basel and Bamako conventions (Liza& Francis, 2016; Asimwe & Åke, [01] G., 2012; Schluep [23] et al., 2012; Pérez-Belis et al.,[20] 2015). The Basel convention was put in place in 1992 to control the trans boundary movement of hazardous wastes and their disposal. • In 2006, the convention adopted new guidelines on Environmentally Sound Management (ESM) of used and end-of-life mobile phones.
INDIA	<ul style="list-style-type: none"> • The Hazardous Wastes (Management and Handling) Amendment Rules, 2003 • Guidelines for Environmentally Sound Management of E-waste, 2008 • The e-waste(Management and Handling) Rules, 2011(Singh, [24] 2012)

3.3 Responsibility

Table 3

EUROPE	<ul style="list-style-type: none"> Imposes an obligation to the electronic and electronic product manufacturers to take back the end of life products and provide a framework of the various measures for manufacturers including collection, recovery and treatment of WEEE. (Wäger [30] et al., 2011).
USA	<ul style="list-style-type: none"> More than 20 states have enforced legislation to manage e-waste and most of them are based on extended producer responsibility policy. Some states are, however, advanced like in California; a number of companies are working on the collection, recovery and reuse of e-waste (de Oliveira et al., 2012).
UNITED KINGDOM	<p>The Mandatory Requirements of Article 28 of the Revised WFD Specify that the Plan Should Contain the Following Information:</p> <ul style="list-style-type: none"> An assessment of the need for new collection schemes, the closure of existing waste installations, additional waste installation infrastructure in accordance with Article 16 (on the proximity principle), and, if necessary, the investments related thereto.(Rogerson, [21] 2013).
JAPAN	<ul style="list-style-type: none"> Consumers are required to work together with the collection of their WEEE to retailers. The “recycling fee” is introduced as pre-treatment fee and consumers need to agree with that. Additionally, consumers are often charged the transportation fees (Bo & Yamamoto, 2010)..
GERMANY	<ul style="list-style-type: none"> Germany was the first EU country to introduce producer responsibility for waste packaging in 1991, under the Packaging Ordinance(European Municipal Agency, 2013). This requires product manufacturers to take back packaging they have placed on the market and re-use it or recycle its constituent materials, or have this done by a third party (known as Extended Producer Responsibility, through an EPR Scheme)(Seyring [25] et al., 2015).
CHINA	<ul style="list-style-type: none"> The introduction of extended producer responsibility (EPR) with well-defined roles for all participants – producers, users, authorities and waste managers is essential for designing an effective e-waste management system (Lindqvist 2000).
KENYA	<ul style="list-style-type: none"> Consumers not responsible for sending back the e-waste EPR not operational Dismantling not responsible for safe handling of e-waste
INDIA	<ul style="list-style-type: none"> Reduction in the use of Hazardous Substances (RoHS)’ in the manufacture of Electrical and Electronic Equipment. Under rule 15, every producer of electrical and electronic equipment will have to ensure that, new electrical and electronic equipment does not contain Lead, Mercury, Cadmium, Hexavalent Chromium, Polybrominated Biphenyls (PBB) or Polybrominated Diphenyl Ethers (PBDE).

It is clear from this comparison:

- In India there is no financial scheme is available to promote the end users of electronics products to contribute in e-waste management. It is a very important factor which plays a great role in collection of e-waste as everybody in India consider their financial benefits.
- The various policies regarding e-waste management and safe disposal of e-waste is present in India, but the problem with these policies are that they are not implemented properly. If these policies are implemented properly the effectiveness of e-waste management system should be increased considerably.
- Government of India directed the electronics products manufacturer not to use the hazardous substances like lead, mercury, cadmium etc. but we are lacking here also. There is no proper monitoring system present in India to monitor either manufacturer following their guidelines or not.

CONCLUSIONS

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FUTURE SCOPE

- As we compare Indian policies of e-waste management with Europe, USA, United Kingdom, Japan, Germany, China, Kenya. There is a scope to compare Indian policies with some developed countries and also some developing countries.
- Here our comparison based on the three points. There is a scope for other researchers to find out the other points to compare the policies.

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